# **Original Research Article**

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# A randomised comparative study of coconut oil massage for effect on weight change in low birth weight neonates

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#### **ABSTRACT**

**Background:** Low birth weight (LBW) babies have more the risk of the neurological complications, physiological problems and mental retardation. Topical massage with natural oil is routinely practiced in India. The positive effects of massage are weight gain, improved sleep/wake pattern, decreased the stress, early discharge from the neonatal intensive care unit (NICU), improve the skin integrity and enhanced parent's infant bonding.

**Methods:** This prospective interventional randomised comparative study was conducted among 64 LBW babies at Paediatric department of Swami Dayanand hospital (SDH), Delhi. Out of which 31 were in intervention group and 33 were in control group. In the intervention group, mothers were encouraged to massage their babies with 10 ml of coconut oil for 15 min, twice a day until 10 days of life. Those allocated to the control group were received care as usual. Weight and head circumference was measured at enrolment and on day 11 in both the groups.

**Results:** Basic characteristics of neonates of intervention and control group were almost similar. Mean weight gain in intervention group was 352.26±101.05 g while it was 209.70±124.66 g in control group (p=0.0001). Similarly mean weight gain velocity was significantly higher in intervention group (32.02±19.19 g/day) as compared to control group (19.09±11.33 g/day, p=0.0001).

**Conclusions:** The present study supports significant increase in weight gain in LBW preterm and term neonates with coconut oil massage. Coconut oil is easily available in the market and it should be recommended to LBW babies for their better weight gain.

Keywords: Coconut oil, Head circumference, Low birth weight, Massage, Weight gain

# INTRODUCTION

Low birth weight (LBW) is one of the most serious problems in today's world. According to UNICEF, death due to LBW account for 26% and 35% of neonatal death in the world and India respectively. LBW babies have more the risk of the neurological complications, physiological problems and mental retardation. <sup>2,3</sup>

Sensory stimuli are one of the basic human need is specially to facilitate development of infants. Touch refer to contact between objects. A methodological touch intended to stimuli the baby is referred as a massage. Skin massage is a considered as therapeutic touching

intervention that has a physiological and mental effect on the infant.<sup>4</sup>

Topical massage to neonate with natural oil is routinely practiced in India. This practice has gained favor in neonatal intensive care units (NICU) in the developed countries as well.<sup>6</sup>

Topical oil application has been shown to improve sleep/wake pattern, thermoregulation, weight gain, decrease the stress, early discharge from the NICU, improve the skin integrity, increase the development of the sympathetic nervous system and enhanced parents infant bonding.<sup>5</sup> Various studies observed superior growth with

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tactile kinesthetic stimulation in LBW babies.<sup>7,8</sup> Massage with oil increases the production of triglycerides, due to increased transcutaneous absorption of oil.<sup>9</sup> The aim of the study was to determine the effect of coconut oil massage on growth velocity in preterm and term babies.

# **METHODS**

This prospective interventional randomised comparative study was carried out for duration of 10 months (March to December 2020) at Paediatrics department, Swami Dayanand Hospital, Delhi after approval from Institutional Ethics Committee.

# Sample size

The study of Dour et al observed that weight gain in preterm infants with or without oil massage as 21.6 g/day and 19.2 g/day respectively. The mean difference in weight gain in two groups was 2.4 g. We assume that difference in weight gain would be 20% more or less than 2.4 g and assuming standard deviation of 2.5 g. Taking these values as reference, the minimum required sample size with 90% power of study and 5% level of significance was 29 patients in each study group with using below mentioned formula:

$$N \ge \frac{2 (SD)^2 (Z_{\alpha} + Z_{\beta})^2}{(Mean \ Difference)^2}$$

To reduce margin of error, total sample size taken was 60 (30 patients per group). Taking attrition rate to be 10%, final sample size comes out to be 66 (33 per group). Two of them were lost on follow up so data has been analysed for 64 babies out of whom 31 were in intervention group and 33 were in control group. Informed consent was obtained from the parents before recruitment.

Neonates with following criteria were included in the study- (a) babies with 1800 to 2499 g birth weight; (b) 48 to 72-hour age; (c) babies on full feed and (d) hemodynamically stable babies.

Neonates were excluded if (a) they had major congenital malformation; (b) babies who received top feed during the course of study; (c) babies whose more than three sessions of massage are skipped for more than 24 hours. Randomization was done using random number table generated by Microsoft excel (2010) version. Sealed opaque envelop technique was used for concealing treatment allocation. The intervention was introduced to the mother following allocation into the massage group on day third of life.

Details of obstetric history, mode of delivery, the socioeconomic status, and presence of risk factors for sepsis were noted in predesigned proforma. Mothers were taught the techniques through demonstration and were encouraged to massage their babies with 10 ml of

parachute coconut oil for 15 min, twice a day until 10 days of life (first-between 10:00 am to 11:00 am and second-between 7:00 to 8:00 pm). Those allocated to the control group received care as usual.

The regime for the massage was taken from the study Scafidi et al.<sup>11</sup> The 15 min stimulation sessions consisted of three standardized 5 min phases. Tactile stimulation comprised the first and third phases, and kinesthetic stimulation was given during the middle phase. If the baby passed urine or stools or started crying during the session, massage was temporarily stopped till the baby was comfortable again. Weight and head circumference was measured at enrolment (day 3 of life) and on day 11 of life in both the groups.

The data was entered in Microsoft excel 2010 and analysis was done using Epi info version 7. Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean±SD. The comparison between two groups was performed using independent t test. Categorical variables were compared by Chi square test.

# **RESULTS**

Demographic profile and basic characteristics of neonates of intervention and control group are shown in Table 1 and 2. All characteristics were almost similar. Mean weight at enrolment of both groups was not significantly different (intervention group: 2.17±10.17 kg, vs control group: 2.21±0.21 kg, p=0.329).

Mean weight gain in intervention group was 352.26±101.05 g while it was 209.70±124.66 g in control group (p=0.0001). Similarly mean weight gain velocity was significantly higher in intervention group (32.02±19.19 g/day) as compared to control group (19.09±11.33 g/day, p=0.0001). Weight change per kg per day was 14.76±4.09 g/kg/day in the intervention group and 8.65±15.37 g/kg/day in the control group (p=0.0001).

Mean weight gain for preterm babies from enrolment was 328.75±89.35 g in the intervention group and 193.00±126.41 g in the control group (p=0.034). Weight gain per kg per day in intervention group was also significantly higher than control preterm group (14.66±4.06 g/kg/day vs 8.31±5.49 g/kg/day respectively, p=0.016). Similar finding was observed in term babies (intervention vs control group- mean weight gain: 360.43±105.42 g vs 216.96±126.04 g, p=0.0001; weight gain velocity: 14.79±4.19 g/kg/day vs 8.80±5.43 g/kg/day, p=0.001).

Mean gain in head circumference was not significantly different in oil massage group  $(1.04\pm0.19~\text{cm})$  and control group  $(0.98\pm0.48~\text{cm},~p=0.485)$ . Similar findings were observed for preterm babies of intervention group vs control group and term babies of intervention vs control group.

Table 1: Comparison of socio demographic profile between control and intervention group.

Socio demographic profile	Control (N=33)	Intervention (N=31)	P value (t test)
Maternal age	25.53±3.05	25.24±3.38	0.552
Mean year of maternal education	$10.58\pm2.44$	10.77±2.38	0.923
Family income	15000.0±3247.6	13790.3±3919.5	0.325

Table 2: General characteristics of neonates between control and intervention group.

General characteristics	al characteristics Control (N=33) (%)		P value (Chi square test)	
Modes of delivery				
NVD	24 (72.8)	23 (74.2)	0.966	
AVD	4 (12.1)	4 (12.9)		
CS	5 (15.1)	4 (12.9)		
Type of delivery				
Pre-term	10 (30.3)	8 (25.8)	0.784	
Full term	23 (69.7)	23 (74.2)		
Neonate				
Singleton	28 (84.8)	31 (100.0)	0.053	
Twin	5 (15.2)	0 (0.0)		
Neonate size				
AGA	13 (39.4)	8 (25.8)	0.294	
SGA	20 (60.0)	23 (74.2)		
Gender				
Female	16 (48.5)	15 (48.4)	1.00	
Male	17 (51.5)	16 (51.6)		
Birth order				
1	16 (48.5)	17 (54.8)	0.059	
2	15 (45.5)	7 (22.6)		
>2	2 (6.1)	7 (22.6)		
Age at enrolment (hrs)	54.67±5.73	51.77±2.69	0.012*	
KMC				
Started at (hrs)	38.82±6.47	37.10±6.71	0.301*	
Provided (hrs/day)	3.70±0.65	3.55±0.67	0.393*	

Note: \*P value was calculated by independent t test.

Table 3: Growth characteristics among control and intervention group.

Detail of weight (kg)	Control (N=33)	Intervention (N=31)	P value (t test)
Weight at birth (kg)	2.28±0.18	2.26±0.20	0.694
Weight on day 3 (kg)	2.21±0.21	2.17±0.17	0.329
Weight on day 11 (kg)	2.42±0.25	2.51±0.22	0.103
Weight gain (g)	209.70±124.66	352.26±101.05	0.0001
Weight gain (g/day)	19.06±11.33	32.02±9.19	0.0001
Weight gain (g/kg/day)	8.65±5.37	14.76±4.09	0.0001
Detail of HC			
HC at on day 3	32.58±0.93	32.66±1.01	0.717
HC on day 11 (cm)	33.57±0.92	33.70±1.06	0.61
Change in HC (cm)	$0.98\pm0.48$	1.04±0.19	0.485
Change in HC (cm/day)	$0.09\pm0.05$	$0.09\pm0.02$	0.503
Pre-term babies	Control (N=10)	Intervention (N=8)	P value (t test)
Weight gain (g)	193.00±126.41	328.75±89.35	0.034
Weight gain (g/day)	17.55±11.49	29.89±8.12	0.034
Weight gain (g/kg/day)	8.31±5.49	14.66±4.06	0.016
Term babies	Control (N=23)	Intervention (N=23)	P value (t test)
Weight gain (g)	ght gain (g) 216.96±126.04		0.0001
Weight gain (g/day)	19.72±11.46	32.77±958	0.0001
Weight gain (g/kg/day)	8.80±5.43	14.79±4.19	0.001

#### **DISCUSSION**

# Basic characteristics

In the present study, male/female ratio, maternal age, education of mother, family income, mode of delivery were comparable in both the control and intervention group in the present study (p>0.05 for all variables). Both the groups were homogenous with respect to birth weight, proportion of Appropriate for gestational age (AGA) and Small for gestational age (SGA), Kangaroo mother care (KMC) duration, weight and head circumferences (HC) at enrolment. Both term and pre-term LBW babies were included in the study. Most of the studies as shown in Table 4 documented the growth benefit of oil massage in preterm infants.7-12 Only two studies included term neonates, Sankarnayanan et al and Agarwal et al.<sup>7,9</sup> Previous studies as shown in Table 4 did not mention KMC duration and AGA/SGA proportion of recruited babies.7-12

#### **Growth characteristics**

In the present study, neonates were enrolled on day 3. Neonates were enrolled at day 2 of life by Sankarnarayan et al, at less than 10 days of life by Arora et al at day 20 of life by Scafidi et al and at 25.6 days in intervention group and 22 days in control group by Dieter et al.<sup>7-9,11</sup>

In the present study, significant weight gain in coconut oil massage group was noted (intervention group vs control group- 352.3±101.1 g vs 209.7±124.7 g, p=0.0001). Weight gain velocity was calculated which was also significantly higher in intervention group [intervention group vs control group- weight gain (g/day): 32.02±9.19 g/day vs 19.06±11.33 g/day, p=0.0001, weight gain (g/kg/day): 14.67±4.09 g/kg/day vs 8.65±5.37 g/kg/day, p=0.0001]. Weight gain in pre-term babies and term babies of intervention group was also significantly higher than control group.

All the studies discussed in Table 4 reported positive effects of oil massage on weight gain. except study conducted by Arora et al and Agarwal et al.<sup>7-12</sup> Study of Sankarnarayanan et al showed 10.99±2.57 g/kg/day weight gain among preterm babies in coconut oil massage group and it was significantly higher than in mineral oil massage group (9.02±2.13 g).<sup>7</sup> Difference in mean weight gain in term neonates was statistically insignificant between coconut oil (9.19±1.55 g/kg/day) and mineral oil massage (8.78±1.67 g/kg/day). However, it was significantly higher than the placebo group (8.22±1.76 g/kg/day). Weight gain velocity is higher in oil massage group in the present study compared to that of Sankarnarayan et al.<sup>7</sup>

This may be due to the difference in procedure. In our study, two sessions of massage were done daily for 15 min while in Sankarnarayanan et al four sessions of massage were done for 5 min each. <sup>7</sup> Total duration of massage per day was more in the present study. Also, lesser number of longer sessions may be more effective than more number of shorter sessions. This may also be because of less repeated dressings and less temperature instability with fewer sessions in the present study. In the study by Douret et al, pre-term neonates were divided into four groups massage with sweet almond oil, ISIO4 oil, placebo and control.10 In this study, ISIO4 oil massage showed significant weight gain (301 g) as compared to sweet almond oil massage (216 g). In study by Scafidi et al mean weight gain (g/day) in intervention group was 25 g/day as compared to the non-massage group (17 g/day, p=0.0001). 11 However, Arora et al and Agarwal et al did not support a significant increase in weight gain in any of the oil massage group.<sup>9,12</sup>

Current study found no significant difference in gain of head circumference between two groups (intervention group: 1.04±0.19 cm vs 0.98±0.48 cm, p=0.485). Similar finding was observed in previous studies (Arora et al and Agarwal et al). 9.12

Table 4: Comparison of various studies regarding weight changes of neonates due to application of massage.

Author	Samp le size	Groups	Gestati- onal age	Age at beginnin g of the study	Duration of each session	Total duration	Mean birth weight	Weight change
Sankarn ayan et al. <sup>7</sup>	224 (term and pre- term)	Coconut oil/ mineral oil/ placebo	34.8±1.3, 34.8±1.1 34.9±1.2	Day 2	5 min 4 times	Till 31 day	Pre-term 1792.8±149.5/ 1758.3±79.9 1789.8±182.9 Term 2771.2±309.4 2771.7±95.3 2852.3±270.3	Velocity (g.kg/day) 10.99±2.57/ 9.02±2.13/ 8.45±2.75, p=0.02
Agarwal et al. <sup>12</sup>	125 (term)	Herbal oil/sesa- me oil/ mustard oil/	>37 weeks	6 weeks		4 weeks	>2500	800±200/10±300/ 1000±300/ 900±300, p>0.05

Continued.

Author	Samp le size	Groups	Gestati- onal age	Age at beginnin g of the study	Duration of each session	Total duration	Mean birth weight	Weight change
		mineral oil/ control group						
Dieter et al.8	32 pre- term	massage therapy/ control group	30.1±2.5/ 31.1± 2.8	22-25 days	15 min thrice a day	5 days	1359.3±140. 1/1421.5±91.9	243.5±184.5/ 113.5±60.7, p=0.03
Saedi et al. <sup>11</sup>	121 pre- tem		30.8±2.4/ 31.6 ±2.7	Day 1			1484±3.5/ 17635.9/ 1564±3.9	105±1.3/52±0.1/ 54±1.3 (p=0.002)
Douret et al. <sup>10</sup>	49 pre- term	Sweet almond oil/ ISIO4 oil/ placebo/ control group	33.1±0.8/ 33.5±0.8/ 33.4±0.9/ 32.7 1.3	Day 5	15 min twice a day	10 days	1933±297/ 1820±397/ 1980±283/ 1545±355	216/301/230/192 (p=0.03)
Arora et al. <sup>9</sup>	69 pre- term	Oil massage/ massage/ control group	33.9±1.7/ 34.6±1.1/ 34.7±1.5	<10 days of life	10 min thrice a day	28 days	1280.2±170/ 1298.6±175.4/ 1327.1±125.1	Velocity (g.kg/day 10.9±4.4/ 8.7±4.6/8.3, p>0.05
Present study	64 (pre- term and term)	Coconut oil/contr ol group	38.4±2.0/ 37.9±1.9	Day 3	15 min thrice a day	Till 10 days of life	2260 200/2280 180	Total weight gain 352.2±101.1/ 209.7±124.6, p=0.0001 velocity 14.7±4.1/8.6±5.4, p=0.0001

# Limitations

Babies were not directly observed throughout the period as they were discharged after 2 days of training. Compliance was poor for the steps done in prone position as baby was uncomfortable and more crying was observed in that position. Pressure required to do the steps of massage is not very clear and its assessment is difficult.

# **CONCLUSION**

Coconut oil massage resulted in more weight gain as compared to the control group. Coconut oil massage improves weight gain in both preterm and term babies. However, oil massage did not contribute significantly to increase in head circumference. Coconut oil is easily available in the market and possess potential to improve growth in babies so it should be recommended to LBW babies for their better weight gain.

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